Hungry Canyons Alliance

Streambed Stabilization in Deep Loess Regions

Knickpoints, Gullies, and Stream Widening

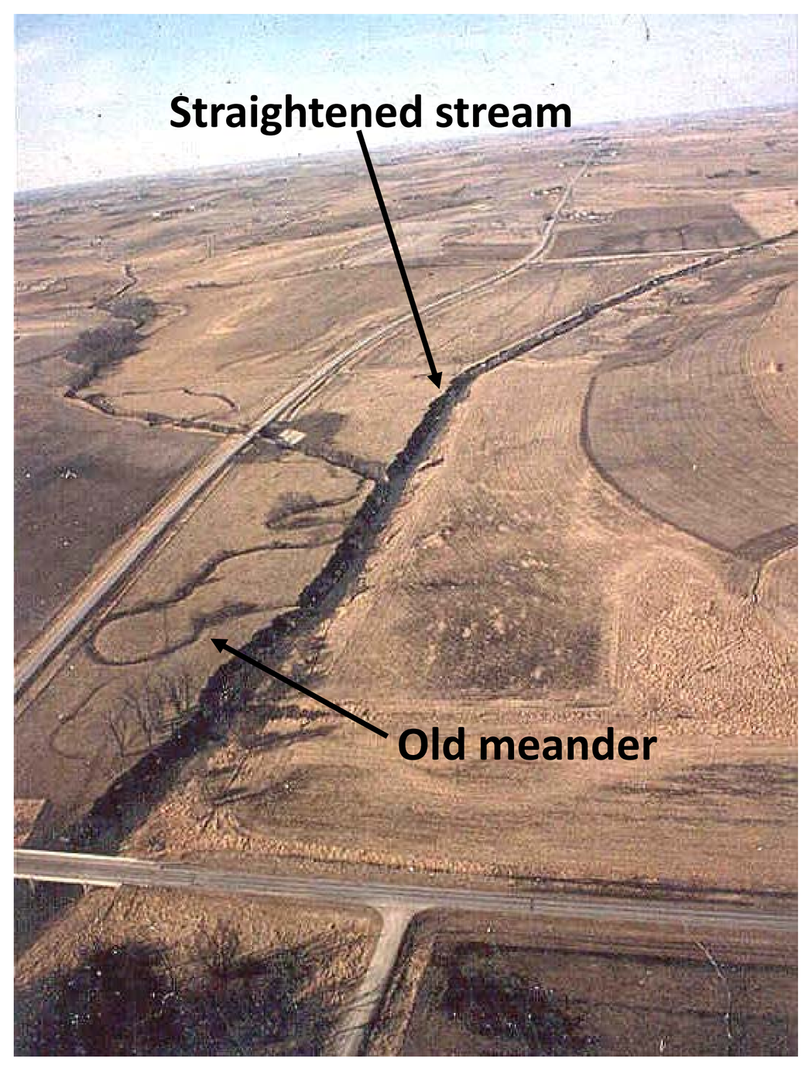
Rapid Gully Growth

These knickpoints formed during the May 2007 floods. They migrated 314 feet upstream by December 2007, eroding approximately 5,000 tons of sediment.

Problem: Degrading Streams

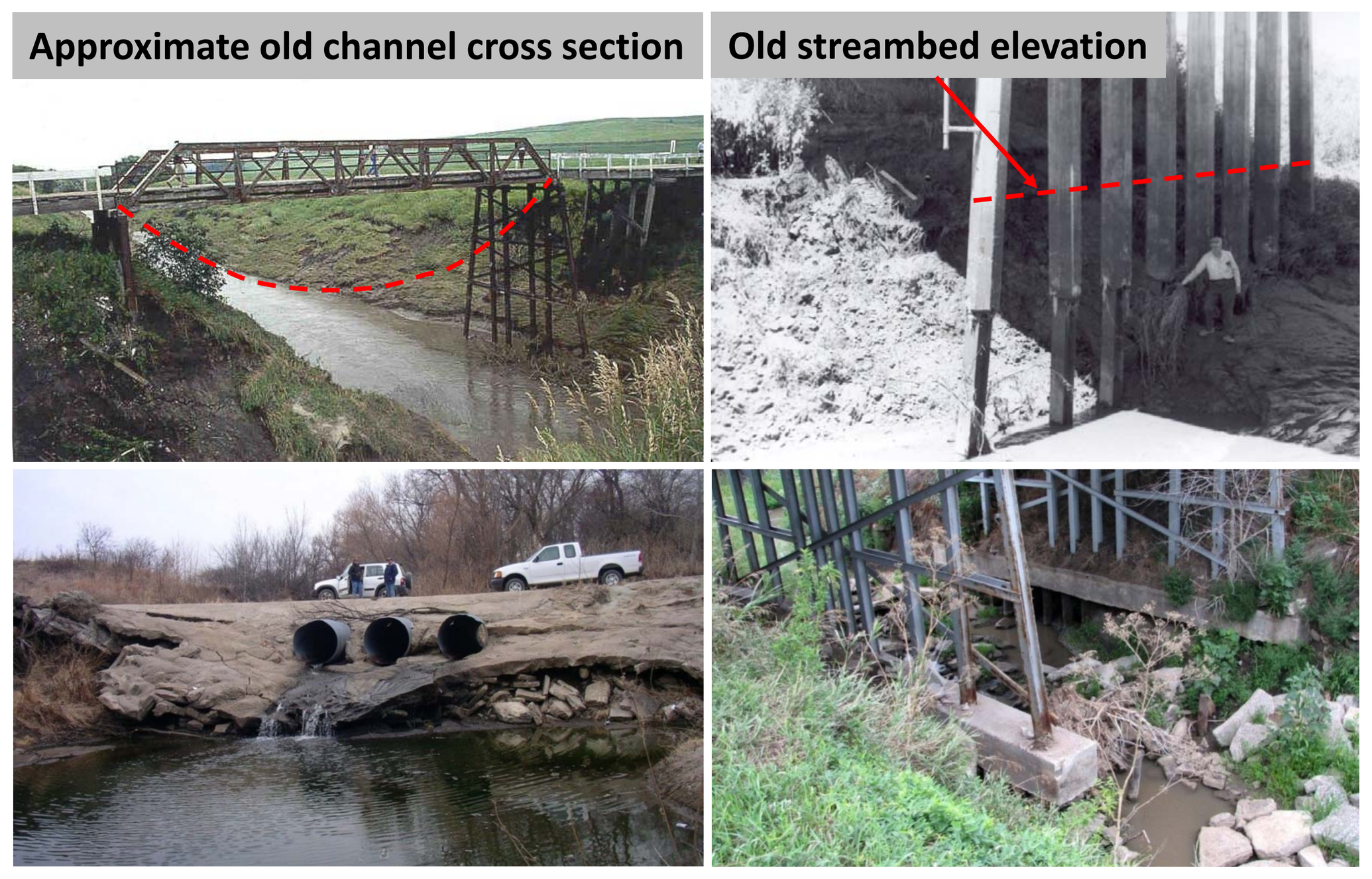
Causes of Streambed Degradation

Highly erodible loess soils
+
Stream straightening and land use changes
=
Higher water velocities
=
Channel downcutting
=
Accelerated soil erosion

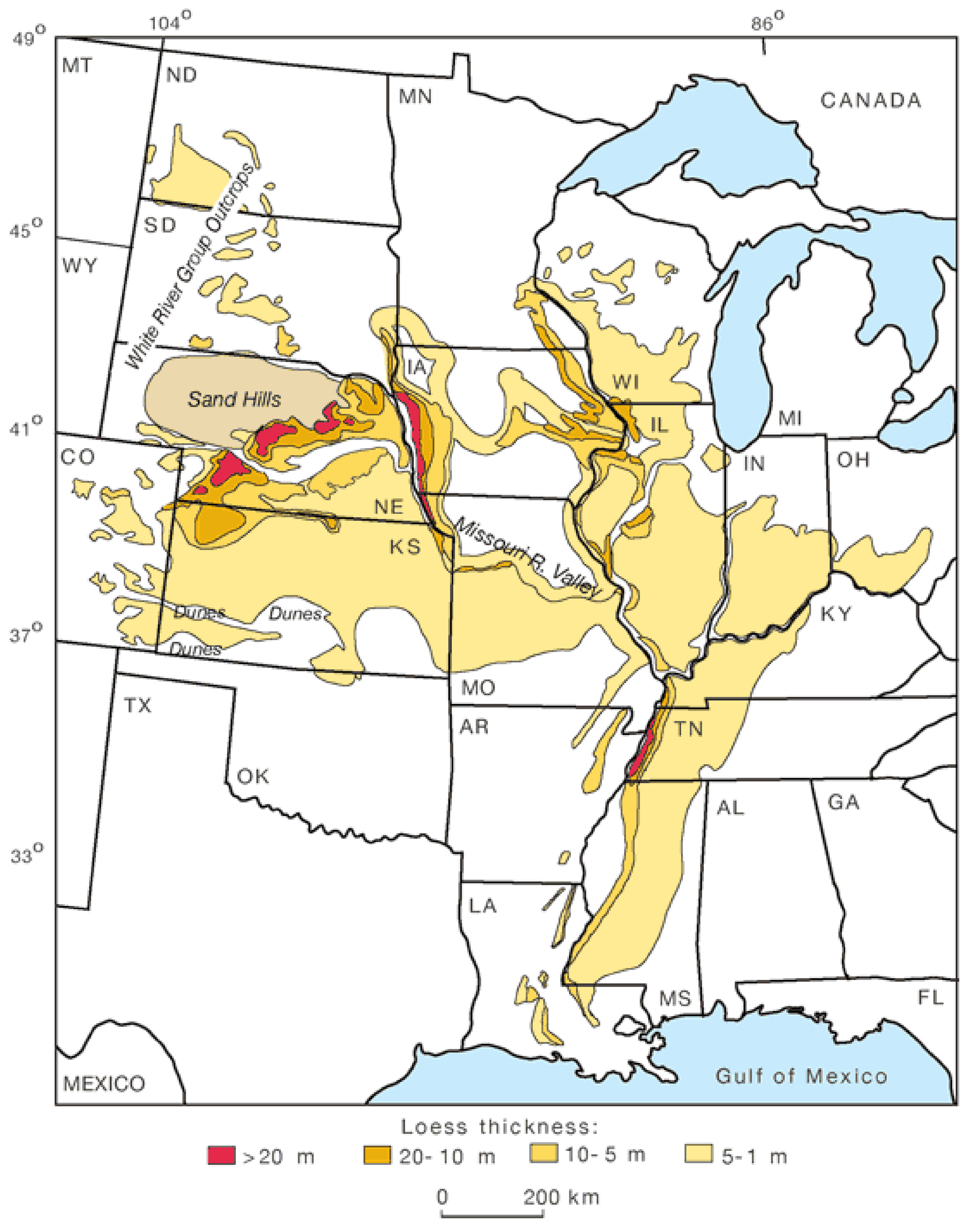


HCA Mission Statement:

To focus attention on the problems of, and develop solutions related to, stream channel degradation in counties with deep loess soils, especially in western Iowa



County road infrastructure damage due to streambed degradation



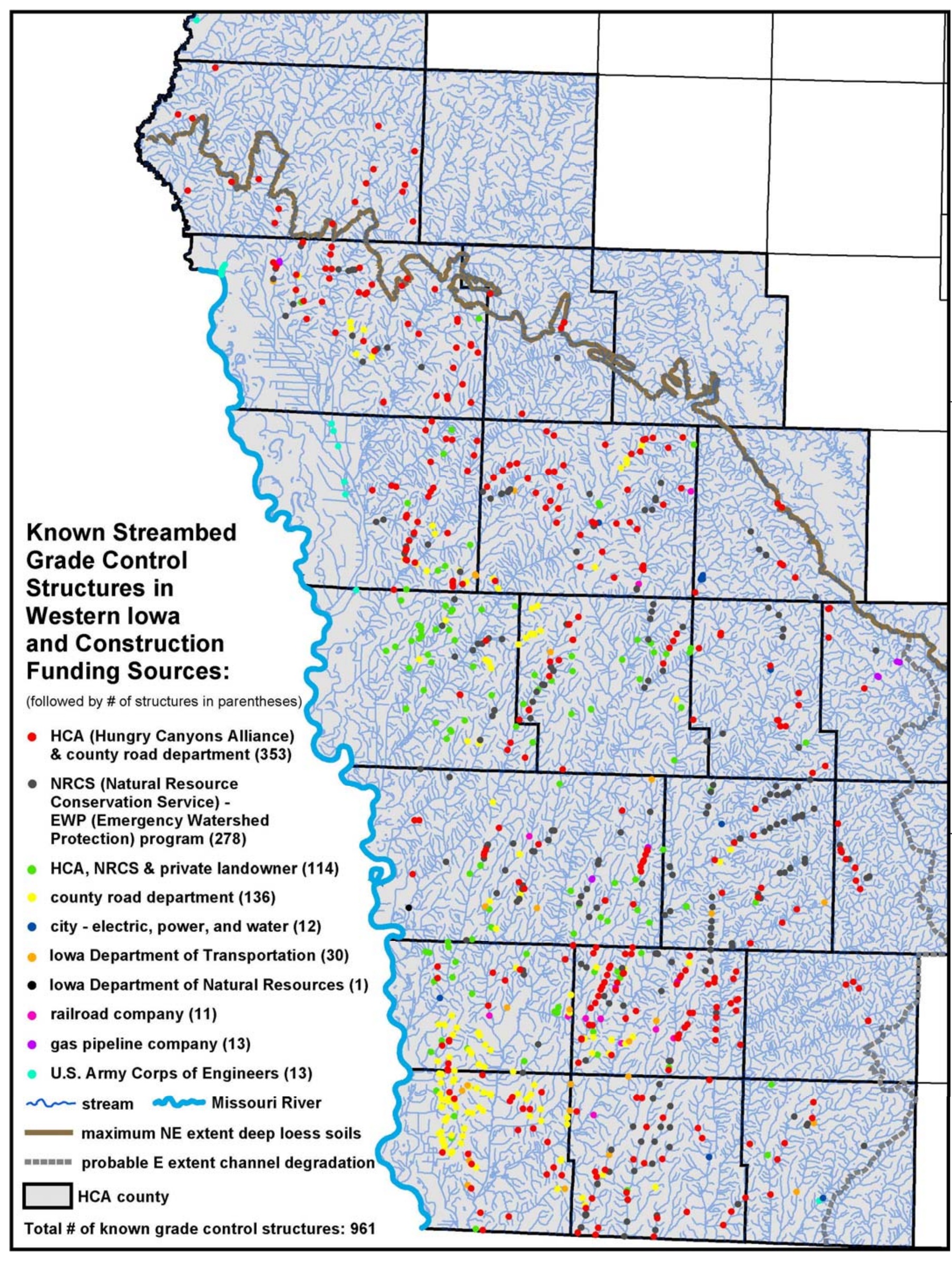
HCA Streambed Stabilization and Watershed Consciousness

- Knickpoints affect entire watershed as erode upstream
- Streambed stabilization is key to preventing further erosion and protecting infrastructure
- Structures at regular intervals change the stream profile from erosive steep incline to stable stair-step pattern
- HCA provides state and federal funds to member counties to build grade control structures (GCS); county governments provide a minimum of 20% match for each GCS
- Average cost for a GCS is $65,500
- GCS design dependent on drainage area
  - Small drainage areas: CMP or RCB drop inlets or flume outlets
  - Large drainage areas: Steel sheet pile, concrete grout, and rip-rap weirs

Benefits of HCA Grade Control Structures

- Decreases slope of streambed
- Prevents further downcutting
- Creates an upstream backwater condition
  - Sediment settles out upstream
  - Reduces sediment loads
  - Protects bridge pilings
- Bridges/culverts/roads protected
- Protection of numerous utility lines (electric, phone, gas, sewer, water)
- Protection of farmland (650+ acres)
- Reduced sediment loads and improved water quality (22.7 million tons of sediment protected)
- Prevention of soil movement into the Missouri and Mississippi Rivers
- Reduction of the hypoxic "dead zone" in the Gulf of Mexico
- Incorporates fish passage
- **For every $1 invested in Hungry Canyons Alliance structures, more than $4.20 in property value and one ton of soil are protected.**

Solution: Grade Control Structures

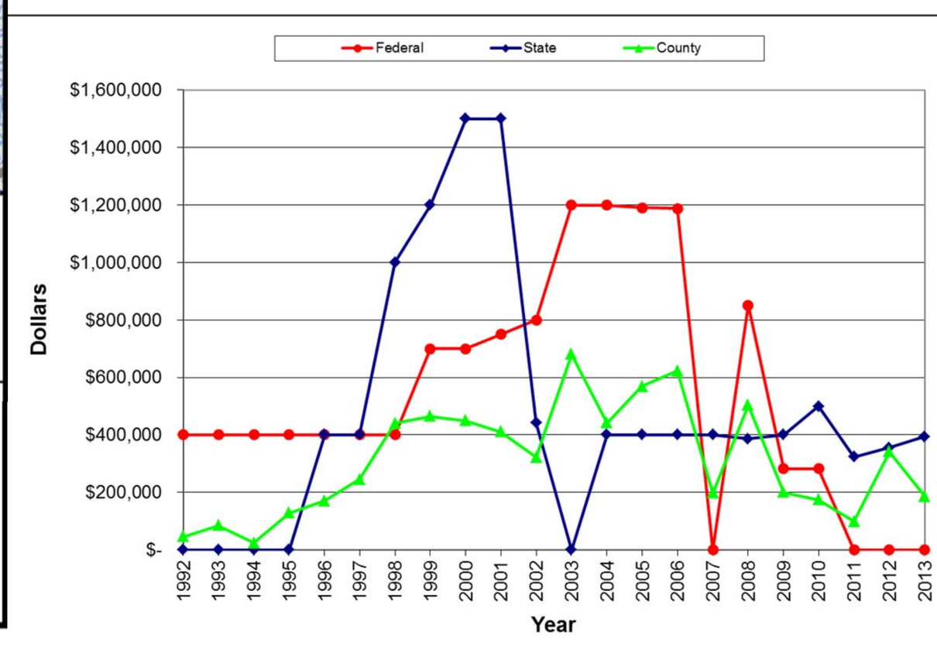


Loess Soils and Streambed Degradation

- Loess is a wind blown silt deposit often formed near large river valleys. It is a very erodible material, especially when saturated. In fact, loess is more stable and less erodible when standing as a vertical cut than when on a slope.
- Although there are other pockets of loess around the world, none have the combination of thick loess deposits, large spatial area, high road density, and widespread stream alteration that is found in the Mississippi River Valley. These factors increase the potential for widespread stream channel downcutting and erosion in this region.

The map to the left shows the Hungry Canyons Alliance area in western Iowa. The brown line represents the northern limit of the deep loess region; northeast of this line glacial till is located near the surface. The dashed gray line represents the furthest east widespread streambed degradation is occurring; east of this line the loess is less than 15 feet deep and streams have been less channelized.

Due to the widespread streambed degradation, coupled with the high road and drainage densities, it is estimated that approximately $1.1 billion in damage to infrastructure and loss of land has occurred in this region. To correct this stream instability, a system of probably 1,500 grade control structures has been built downstream of infrastructure throughout western Iowa – the highest concentration of grade control structures (GCS) anywhere in the world.



Three Sources of HCA Funding:

1. Member counties provide annual dues of $3,000 and at least 20% of GCS costs.
2. The State of Iowa has provided ≈ $400,000/yr since 2002.
3. Prior to 2011, the Federal government provided funds through the Natural Resources Conservation Service (NRCS) as an earmark in the Conservation Operations budget, but since 2011 has provided $0.

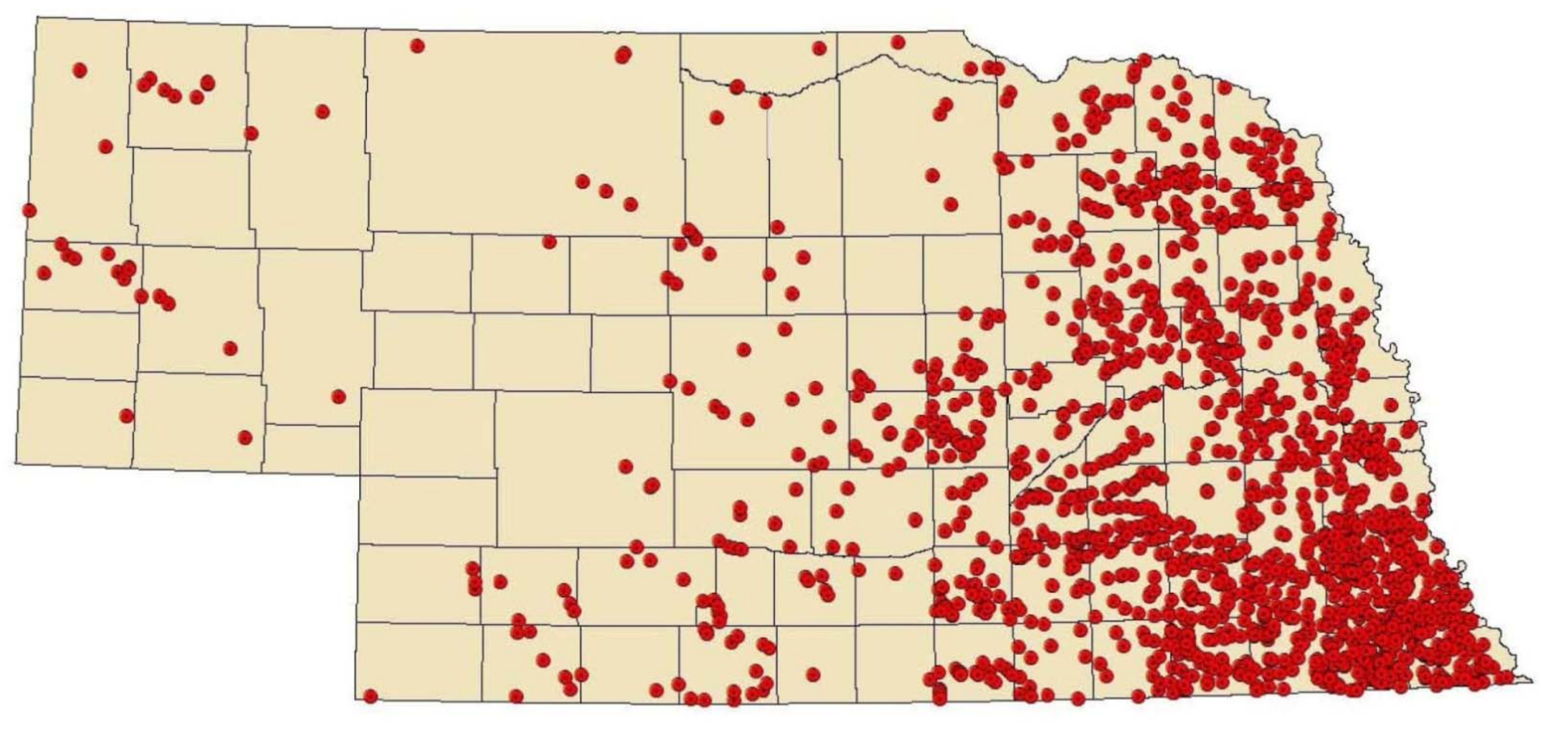
HCA funding 1992-2012: 42% federal, 36% state, and 22% county

A Call To Action – Need States to Join Our Cause

A gap currently exists in federal programs/funding for grade control mitigation projects that control stream downcutting and erosion on small to medium sized streams, particularly in the Mississippi River Valley Region where there is a greater susceptibility to this problem due to our loess soils. The federal government can currently only assist through the Army Corps of Engineers on large rivers and through the Natural Resources Conservation Service (NRCS) on very small drainages.

<u>The Hungry Canyons Alliance (HCA) has proposed a new initiative through the NRCS be authorized to provide funding for grade control projects throughout the US in deep loess areas where streams are actively downcutting and eroding</u>. This new initiative/program would be similar to the NRCS's Emergency Watershed Protection (EWP) Program in that funds could be directed to public entities, while also targeting specific areas (deep loess) and providing for non-emergency, mitigation projects. The NRCS would likely have a program coordinator/board at the national level that would send out RFP's and review the applications, awarding funding on a merit basis.

This initiative would fill the gap and add a federal funding mechanism that would benefit not just Iowa, but other states as well. The strength of this initiative lies in the support of as many states as a possible to make our local issues a national one. Nebraska has agreed to support this proposal and now we are looking for support from the other states shown in the map above the have widespread loess deposits, specifically the states of Missouri, Kansas, Illinois, Tennessee, and Mississippi.



Scour Critical Bridges in Nebraska

Source: NDOR "Bridge Inspection Program Manual", November 1, 2011

Although not all scour at bridges is due to streambed degradation (the other two types are local and contraction), most of the critical bridge ratings in eastern Nebraska are due to streambed degradation. Evidence like this helped to convince Nebraska counties to support the HCA's proposed new federal initiative.

Small Structures for Landowners: Cost share partnership between HCA, NRCS, Iowa Division of Soil Conservation, and Soil and Water Conservation Districts